

# Characteristics of Stroke in Obese and Overweight People at the Neurology Department of the Ignace Deen National Hospital

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## Abstract

**Introduction:** Obesity is a set of disorders that exposes the subject to an increased risk of occurrence of cardiovascular disease. This study aimed to evaluate the epidemiological and clinical aspects of obese patients with stroke in the neurology department of the Ignace Deen National Hospital. **Material and Methods:** We conducted a prospective study of the descriptive type lasting 6 months from 08/01/2021 to 02/28/2022. The study focused on patients hospitalized for CT confirmed stroke and having a BMI > 25 or a waist circumference > 88 cm for women and >108 cm for men confirmed at the neurology department of the Ignace Deen National Hospital during the study period and who agreed to participate in the study. Our variables were qualitative and quantitative. **Results:** Out of 212 (76.2%) cases of stroke, we recorded 118 cases of obese patients, i.e. 55.6%. The stroke was of the ischemic type in 78.81% of cases. There was a female predominance with a sex ratio of 0.94. The average age of our patients was  $61.15 \pm 12.6$  years. The mean NIHSS score at admission was  $10.13 \pm 3.34$  (range: 3 and 20); the stroke was of the ischemic type in 78.8% of cardioemboligenic origin. The most frequent type of obesity was abdominal obesity with 70%, according to the anxiety scale 53.3% had anxiety rated at 8 to 10. The average modified Rankin Score (mRS) at admission was  $3.8 \pm 0.7$  (Extreme: 1 and 5), 89 patients (74.4%) had a moderately severe disability (mRS = 4). **Conclusion:** Obesity is a major public health problem and greatly increases the risk of stroke. In our study, it is common in women with a predominance of ischemic stroke. Emphasis should be placed on prevention and health education to avoid complications.

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## Keywords

Stroke, Obesity, NIHSS

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### 1. Introduction

According to the World Health Organization (WHO), overweight and obesity are defined as an abnormal or excessive accumulation of body fat that can impair health (College of the High Authority of Health, 2011).

And stroke is a neurological deficit of “rapid” onset, lasting more than 24 hours, linked to focal or global cerebral dysfunction, which can be fatal, and whose apparent cause is vascular (Sagui, 2007).

For several decades, the prevalence of overweight and obesity has been rising at a worrying rate worldwide, affecting both developed and developing countries (Corcos, 2012).

In the United States, a country at the forefront of this unfortunate trend, the prevalence of obesity could approach 50% of the adult population if current trends continue (Ward et al., 2019).

According to the latest ObEpiRoche study, in metropolitan France, the prevalence of obesity (body mass index, BMI > 30 kg/m<sup>2</sup>) has risen steadily from 8.5% in 1997 to 17% in 2020 among people over 18, with 2% of them morbidly obese (BMI > 40 kg/m<sup>2</sup>) (Fontbonne et al., 2023).

In Australia, 21.7% and 58.4% of the population were overweight in 2005 (Charles et al., 2008).

In several African countries, obesity has reached epidemic proportions and levels in excess of 30% have been documented in adults. In 2014 the prevalence of obesity was 60% in Seychelles; 52% in Cameroon and Mauritania; 49% in Benin; 47% in Algeria; 41% in Mali; 39% in Botswana; 38% in Zimbabwe and 30% in Ethiopia (Correia et al., 2014).

In Guinea according to the EDS V 2018; 27% of women are overweight or obese. The prevalence of overweight and obesity is the highest in Conakry with a prevalence of 43% (National Institute of Statistics (INS) and ICF, 2019).

The diagnosis of overweight and obesity is based on the body mass index (BMI) calculated from weight (in kilos) and height (in meters) (weight/height squared). For a BMI equal to or greater than 25 kg/m<sup>2</sup> and less than 35 kg/m<sup>2</sup>, the clinical examination should be completed by measuring waist circumference at mid-distance between the last rib and the top of the iliac crest (College of the High Authority of Health, 2011).

The causes of obesity are numerous, such as a sedentary lifestyle, overeating, food preferences, socio-economic status, environmental and cultural influences and physical activity, psychological illnesses (including eating disorders) as well as genetics (Lau et al., 2007).

The risk of stroke increases by 64% in obese people. People with a body mass index (BMI) greater than 30 are two to three times more likely to have a stroke

than those of normal weight (BMI less than 25). Additionally, as your weight increases, your risk of stroke also increases. Studies show that the risk of ischemic stroke increases by 22% in overweight people and 64% in obese people (Hamm et al., 1989; Pouliot et al., 1994).

The objective of this study was to describe the epidemiological and clinical aspects of obese patients with stroke in the neurology department of the Ignace Deen National Hospital.

## 2. Method

This was a prospective descriptive study lasting 6 months from 01/08/2021 to 28/02/2022 in Guinea at the neurology department of the Ignace Deen national hospital (Conakry).

We carried out an exhaustive recruitment of all patients meeting the selection criteria.

This study included patients hospitalized for CT-confirmed stroke with a BMI > 25 or waist circumference > 88 for women and >108 for men confirmed at the Neurology Department of the Ignace Deen National Hospital during the study period.

All hospitalized patients who could not be weighed (comatose) were excluded from this study.

- Anxiety was measured in all patients included using the HAD scale: Hospital Anxiety and Depression scale. The HAD scale is a screening instrument for anxiety and depressive disorders that has been accepted in France since 2002. It comprises 14 items rated from 0 to 3. Seven questions relate to anxiety (total A) and seven others to depression (total D), giving two scores (maximum score for each = 21): points for answers 1, 3, 5, 7, 9, 11, 13 are added together to give total A, and points for answers 2, 4, 6, 8, 10, 12, 14 are added together to give total D (Bjelland et al., 2002).

We performed descriptive statistics on all data, with descriptive variables presented as proportions and mean (with standard deviation) or median (with interquartile range) within a 95% confidence interval.

Our data were analyzed using Microsoft Excel software from the 2013 office pack.

Confidentiality and medical secrecy of the data obtained were guaranteed.

The study was approved by the Ethics Committee of the Conakry Faculty of Health Sciences and Techniques.

## 3. Results

Out of 212 stroke cases, we recorded 118 cases of obese patients (55.6%) and 94 cases (44.3%) of non-obese patients.

Sociodemographic data

The average age of our patients was  $59.9 \pm 13.8$  years (extremes: 27 and 85 years), with the 57 - 71 age group being the most representative (49.2%), followed by the 42 - 56 age group (23.7%) and the 72 - 85 age group (19.5%). Females

predominated (66.1%), with a sex ratio of 0.5. The majority of patients (59.2%) did not attend school. Eighty-three patients were married (70.3% of cases); in the socio-professional category, civil servants were the most common, with 40 patients (33.9% of cases), followed by housewives, with 37 patients (31.3%). The majority of our patients came from Conakry (78.8% of cases) (**Table 1**).

**Table 1.** Socio-demographic characteristics of the 118 patients.

<b>Socio-demographic characteristics</b>		
<b>Age ranges</b>	<b>Number (N = 118)</b>	<b>Proportion (%)</b>
27 - 41	9	7.6
42 - 56	28	23.7
57 - 71	58	49.2
72 - 85	23	19.5
<b>Average age = 59.9 ± 13.8 years    Extremes: 27 and 85 years</b>		
<b>Gender</b>	<b>Number (N = 118)</b>	<b>Proportion (%)</b>
Male	40	33.9
Female	78	66.1
<b>Sex-ratio H/F = 0.5</b>		
<b>Education level</b>	<b>Number (N = 118)</b>	<b>Proportion (%)</b>
<b>Out of school</b>	<b>70</b>	<b>59.3</b>
Primary	13	11.0
Secondary	13	11.0
University	22	18.6
<b>Marital status</b>	<b>Number (N = 118)</b>	<b>Proportion (%)</b>
Single	9	7.6
Divorced	2	1.7
<b>Married</b>	<b>83</b>	<b>70.3</b>
widowed	24	20.3
<b>Socio-professional categories</b>	<b>Number (N = 118)</b>	<b>Proportion (%)</b>
Unemployed	13	11.0
Trade	26	22.0
Pupil/Student	2	1.7
Civil servant	40	33.9
Housewife	37	31.4
<b>Origin</b>		
Conakry region	93	78.8
Outside Conakry	25	21.2

#### Clinical data

Hypertension was present in 108 patients (91.5% of cases), with a mean age of  $5.7 \pm 6.8$  years (extremes of 1 and 25 years). Diabetes was present in 35 patients (29.7%), with an age of  $4.8 \pm 3.4$  years (extremes: 1 and 20 years), and previous

stroke in 13 patients (11.0%). High blood pressure also accounted for 75.4% of the family history in our sample, followed by obesity in 42 patients (35.6% of cases). A sedentary lifestyle was the risk factor found in all patients (100% of cases), with an average age of  $17.9 \pm 4.3$  years (extremes of 6 and 45 years). Other risk factors were smoking (12.7% of cases), alcoholism (12.7% of cases) and alcoholism (12.7% of cases) (**Table 2**).

**Table 2.** Vascular history and risk factors in 118 patients.

Vascular history	Number (N = 118)	Proportion (%)
<i>Personal History</i>		
HTA	108	91.5
Diabetes	35	29.7
AVC	13	11.0
<i>Family history</i>		
HTA	89	75.4
Diabetes	35	29.7
Obesity	42	35.6
<i>Lifestyle</i>		
Smoking	15	12.7
Alcoholism	3	2.5
Sedentary lifestyle	118	100

The average admission time was  $2.5 \pm 1.5$  days (extremes: 1 and 14 days).

On clinical examination, according to NIHSS score, 9 patients had Minor Stroke (7.6%), 56 patients had Moderate Stroke (45.7%), 50 patients had Severe Stroke (44%), 3 patients had Severe Stroke (2.4%). The mean NIHSS score on admission was 10,  $13 \pm 3.34$  (extremes: 3 and 20); 81.2% of patients were conscious and oriented on admission with a mean Glasgow score of  $13.2 \pm 2.8$  (extremes: 9 and 15). Hemiplegia and dysarthria were the most common signs, 98.7% and 63.4% respectively. Sixty-three patients (50.8%) had vertigo, 9 patients (7.6%) developed epileptic seizures, seven patients (5.9%) had visual blur, twenty-three patients (20.5%) had meningeal syndrome. Six patients (5.4%) experienced vomiting.

Stroke was ischemic in 78.8% of cases and hemorrhagic in 21.2%. Females predominated, with a sex ratio of 0.94.

The most frequent type of obesity was abdominal obesity with 70%; 39 (30%) patients had generalized obesity.

Average hospital stay was  $7 \pm 4.6$  days (extremes: 2 and 21 days).

According to the Hospital Anxiety and Depression scale (HAD), the largest number of patients, sixty-three (53.4%), had doubtful symptoms rated between 8 and 10; twenty-eight patients (1.7%) had definite anxiety symptoms rated above 11 and (**Table 3**).

**Table 3.** Distribution of patients according to anxiety and depressive symptomatology using the obesity scale.

Anxiety	Number (N = 118)	Proportion (%)
≤7 (no symptoms Anxiety)	27	22.9
8 to 10 (doubtful symptomatology)	63	53.4
11 and more (definite symptomatology)	28	23.7
Depression		
≤7 (no symptoms depression)	12	10.2
8 to 10 (doubtful symptomatology)	45	38.1
11 and more (definite symptomatology)	57	48.3

Mean =  $9.7 \pm 3.9$  Extremes: 3 and 21.

#### Scalable data

Complications arising during hospitalization were inhalation pneumonitis (22%) and urinary tract infections (17.8%), bedsores (13.6%) and venous thrombosis of the lower limbs (3.4%). Twelve cases of death (10.7%) were recorded, 8 of them within the hospital. The mean Modified Rankin Score (mRS) on admission was  $3.8 \pm 0.7$  (extremes: 1 and 5), 89 patients (74.4%) had moderately severe disability (mRS = 4) and 13 patients (11.6%) had moderate disability (mRS = 3), 9 patients (7.6%) had mild disability (mRS = 2), 6 patients (5.1%) had severe disability with mRS = 5. At discharge, the mean mRS was  $3.2 \pm 1.2$  (extremes: 0 and 6), and 40 patients, including 1 patient (mRS = 0; 0.8%), 1 patient (mRS = 1; 0.8%) and 38 patients (mRS = 2; 32.2%). 40 patients had moderate disability (mRS = 3; 0.8%). Patients were reviewed at 3 months; the mean mRS was  $2 \pm 1.7$  (extremes: 0 and 6) and 80 patients, including 27 patients (mRS = 0; 22.9%), 24 patients (mRS = 1; 20.3%), 29 patients (mRS = 2; 25.6%), 10 patients (8.5%) had a favorable outcome with mild disability (mRS < 3) (Table 4).

**Table 4.** Stroke prognostic variables.

Variables	Number (N = 118)	Percentages (%)
Length of hospitalization		
<5	47	39.8
[5 - 10]	53	44.9
>10	18	15.3
<i>Mean: 7 ± 4.6 jours (extrêmes 2-21)</i>		
Complications		
Inhalation pneumonitis	26	22.0
Urinary tract infection	21	17.8
Pressure sores	16	13.6
Venous thrombosis of the lower limbs	4	3.4
None	51	43.2
Degree of disability		

**Continued**

mRS on admission	Number (N = 118)	Proportion (%)
No significant disability (mRS = 1)	1	0.8
Mild disability (mRS = 2)	9	7.6
Moderate disability (mRS = 3)	13	11.0
Moderately severe disability (mRS = 4)	89	74.4
Severe disability (mRS = 5)	6	5.1
Death (mRS = 6)	0	0
<i>Maen</i> = 3.8 ± 0.7 <i>Extrêmes</i> : 1 et 5		
mRS at discharge		
No significant disability (mRS = 1)	1	0.8
Mild disability (mRS = 2)	1	0.8
Moderate disability (mRS = 3)	38	32.2
Moderately severe disability (mRS = 4)	63	53.4
Severe disability (mRS = 5)	7	5.9
Death (mRS = 6)	8	6.8
<i>Maen</i> = 3.2 ± 1.2 <i>Extremes</i> : 0 and 6		
mRS at 3 months		
No significant disability (mRS = 1)	27	22.9
Mild disability (mRS = 2)	24	20.3
Moderate disability (mRS = 3)	39	33.1
Moderately severe disability (mRS = 4)	17	14.4
Severe disability (mRS = 5)	7	5.9
Death (mRS = 6)	4	3.4
<i>Mean</i> = 2 ± 1.7 <i>Extremes</i> : 0 and 6		

## 4. Discussion

During the study period, 212 patients were hospitalized for stroke, 118 of whom had obesity associated with stroke, a frequency of 55.6%.

The frequency observed in our study is in line with that reported by the WHO in 2008: more than 1.4 billion people aged 20 and over are overweight (double the 1980 figure); of these, more than 200 million men and nearly 300 million women are obese. Globally, more than one adult in ten worldwide was obese (Corcos, 2012).

In our study, we found a predominance of women. Our results corroborate those found in France, where obesity predominates in women (17.4% versus 16.7% in men) (Fontbonne et al., 2023).

This could be explained by the fact that more women than men are not physically active, and that only 25% of women are physically active. This fact is bound to encourage the development of obesity, particularly among women (Bauduceau & Bekka, 2020). And because in Africa, obesity has always been a sign of success for women, especially middle-class women.

The average age of patients in the present study was similar to that found by (Ndiaye, 2007), who reported that the age of obese people ranged from 11 to 87 years, with an average of 54 years for men and 43 years for women.

Hypertension and diabetes were the main comorbidities found in our study. This may be explained by the fact that arterial hypertension (AH) is the most frequent complication of obesity, occurring in almost 35% of obese patients. And the pathophysiological mechanisms behind the onset of hypertension in obese patients are manifold: increased adipose tissue, particularly in the viscera, which is the site of synthesis of angiotensinogen, an activator of the renin-angiotensin system that leads to elevated blood pressure, as well as insulin resistance and activation of the sympathetic nervous system (Correia et al., 2014).

Around 50% of Danish stroke patients did not arrive within the 4.5-hour revascularization timeframe in 2018 Danish (Amtoft et al., 2021). Indeed, a survey carried out at the Ignace Deen neurology department in 2014 revealed that only 2% of stroke patients arrived by ambulance, 46% came by public transport, 27% by private car while the rest had to find other means. This lack of accessibility is also reflected in the time elapsed between the onset of stroke and admission to SU closing at 4 days (Cisse et al., 2019). To this day, these conditions of inaccessibility remain valid, which could explain the long delay in admission in our study.

A study aimed at investigating the association between obesity and survival in patients with first-ever stroke; carried out clinical assessment at admission, 7 days, 1, 3 and 6 months post-discharge, and annually thereafter up to 10 years post-stroke. By dividing study patients into 3 groups according to body mass index (BMI): normal weight ( $25 \text{ kg/m}^2$ ), overweight ( $25 - 29.9 \text{ kg/m}^2$ ), and obese ( $30 \text{ kg/m}^2$ ). The mean NIHSS score at admission (11.2) did not differ between the different study groups (Vemmos et al., 2011).

In the same study site as ours in 2019, a study of a general population showed that the mean NIHSS in patients was  $11 \pm 4$  before the intensive care unit was set up and afterwards. The stroke severity of our cohort, reflected by the NIHSS, is lower than that of high-income countries where stroke trials have validated thrombolysis. The NIHSS was five points lower than the mean NIHSS extracted from a meta-analysis of mechanical thrombectomy trials. This relatively low severity of stroke may be explained by the fact that in Guinea, the most severe cases probably failed to reach hospital due to lack of accessibility to hospital in terms of distance, cost and means of health (Cisse et al., 2019).

In our study, ischemic stroke was more frequently associated with obesity than hemorrhagic stroke. This could be explained by the fact that studies show that the risk of ischemic stroke (resulting from obstruction of the blood vessels supplying the brain) increases by 22% in overweight people and by 64% in obese people (Hamm et al., 1989).

As in our study, Canadian population survey data revealed an increase in abdominal obesity to 40.3% (Arsenault et al., 2019). This could be explained by the

fact that these individuals have a higher risk than that predicted solely by their weight status based on BMI. For example, results from the INTERHEART study, carried out in over 27,000 participants in 52 countries, demonstrated that, even when adjusted for BMI, the risk of MI was higher (odds ratio = 1.77 [95% CI: 1.59 - 1.97]) in abdominally obese individuals than in those with a waist circumference in the lowest quintile (Yusuf et al., 2005). The IDEA (International Day for the Evaluation of Abdominal Obesity) study also demonstrated similar results in a cohort of over 168,000 patients from 63 countries, and observed an increased risk of cardiovascular disease and type 2 diabetes in individuals with a high waist circumference in all BMI categories, including those who were not overweight (Balkau et al., 2007).

The comparison between obesity/overweight and normal weight showed a high frequency of obesity/overweight anxiety after a thorough review of 25 studies based on a systematic search of keywords in PubMed databases, Scopus, PsycINFO and Google Scholar until August 2018 (Amiri & Behnezhad, 2019). Anxiety was only significantly associated with obesity in the black population (Dejesus et al., 2016). It is also accepted that 25% to 50% of people who have a stroke will develop an anxiety disorder during the course of the stroke. Our results are weak compared to those of a study of the same African sub-region which was carried out during the period from June 2013 to May 2014; including 108 patients suffering from stroke, including 80 with ischemic stroke and 28 with hemorrhagic stroke, in whom the French version of the "Hospital Anxiety and Depression scale" psychometric scale was used to assess anxiety symptomatology. And which revealed that post-stroke anxiety was 27.8% within the population studied. Mild to moderate anxiety accounted for 60% of cases and moderate to severe anxiety, 40% (Napon et al., 2017). The explanation for this difference lies in the period of study; of the variety and culture of populations which are different; in guinea the population is mainly illiterate and very religious in the face of any phenomenon which exceeds their competence, they prefer to give up rather than try to resolve it.

In Burkina Faso, a study involving 167 patients hospitalized for stroke, 65 (38.9%) patients presented with post-stroke depression (Napon et al., 2012). The intricacy between obesity and depression has been studied by several studies finding not a simple causal link but a reciprocity in the cause and effect relationship (Luppino et al., 2010). However, depression is the most common psychiatric manifestation after a stroke; it is defined as depression occurring in the context of a stroke. Serious consequences both in terms of its social implications, on the quality of life, but also on the patient's possibilities of motor recovery; its estimated prevalence is 30% to 35% with extremes ranging from 20% to 60%. These two facts could explain the high frequency of depression during our study.

Complications in the acute phase of stroke are common (40% - 96%). They constitute an element of poor prognosis, both vital (responsible for 23% to 50% of post-stroke deaths) and functional, which can increase the duration and cost

of hospitalization. Neurological complications, such as cerebral edema, hemorrhagic transformation, epileptic seizures or recurrence of stroke, are less common and occur earlier (in the first 48 to 72 hours) compared to medical complications (notably infections, thromboembolism, depression, etc.). Some can be avoided or, where appropriate, early detection combined with optimal management could be effective in reducing their harmful effects in the short and long term (Chokri et al., 2020).

At previous studies in the same department, patients hospitalized in Ignace Deen's Neurology Department had, for the most part had already survived the first few days and were entering the period the onset of stroke, where medical complications are responsible for a significant proportion of deaths. Out of 784 patients, 23% had an mRS  $\leq 2$  70.3% had an mRS between 3 - 5 (%) and 6.8% had an mRS at 6. Pathological studies have shown that the deaths after the first week were due to embolic pulmonary disease respectively due to pulmonary embolism in 30%, inhalation bronchopneumonia in 27% and heart disease in 37% of autopsied cases of autopsied cases (Cisse et al., 2019, 2022).

Our study could complement the obesity paradox principle, since compared with previously collected data, our sample showed low frequencies of medical complications and high frequencies signaling good improvement in physical disability based on the modified Rankine score assessed at patient discharge.

Indeed, the "obesity paradox theory" states that patients with a high BMI might have a better prognosis than leaner patients (lean paradox) with regard to clinical outcomes in those with cardiovascular disease. This means that even when obesity leads to higher complications and a risk of suffering multiple diseases and complications, high adiposity may present a protective role against infections and, with regard to stroke, better mortality and outcomes (Quiñones-Ossa et al., 2021). As confirmed by these studies conducted respectively by: In 2014; 1791 patients with a diagnosis of class 2 obesity had a lower mortality risk than morbidly obese patients, and in 2019; 99,212 obese patients with hemorrhagic stroke had a lower probability of in-hospital death than non-obese patients (Persaud et al., 2019; Skolarus et al., 2014).

The obesity paradox may be explained by the protective effect of a major endocrine organ called adipose tissue, which secretes soluble TNF-alpha receptors and neutralizes the impact of tumor necrosis factor alpha (TNF alpha) in the human biological system. Overweight and obese patients have higher serum levels of lipoproteins and lipids, which play an important role in lipopolysaccharide detoxification and binding, and are linked to blocking the inflammatory cytokine cascade. In addition, these molecules hinder the inflammatory state after a stroke episode (Quiñones-Ossa et al., 2021).

Our main limitations were: sample size, study duration, period of the COVID-19 pandemic, reluctance of some patients/and or parents to measure waist circumference.

## 5. Conclusion

Obesity is a major public health problem today, and a risk factor for all cardiovascular diseases.

In our study, we found a high prevalence of stroke in obese patients, with a clear predominance of patients with ischemic stroke. Women were the most represented in our study, with abdominal obesity.

Addressing these factors through education and behavioural change will improve the prognosis of stroke, both functionally and vitally.

Further studies over a longer period are needed to detect the link between obesity and stroke.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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